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Sec A

Subject Wastewater Engineering

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Q1:-

Ans: Wastewater treatment:-

It is a process used to used to remove contaminants from wastewater or sewage and convert into an effluent that can be returned to the water cycle with minimum impact on the environment, or directly reused.

Importance:-

Essential for life, clean water is one of the most important natural resources on the planet, which is basically used water, is also a valuable resource, especially with recurring droughts and water shortages in many areas of the world. The importance of wastewater treatment is twofold: to restore the water supply and to protect the planet from toxins.

Why rectangular tanks are preferred over circular tanks for removal of settleable solids during preliminary treatment.

The shape of the rectangular clarifiers provides a longer path for the wastewater flow and the suspended solids to travel, and subsequently longer detention time which warrants less short circuiting and more sludge settling compared to the centerfeed overflow circular clarifiers.

In addition, flow distribution among several clarifiers is usually more even and often requires less head loss for rectangular clarifiers.

Q2. Aerobic wastewater Treatment

- Aerobic processes use bacteria that require oxygen, so air is circulated through the treatment tanks.
- These aerobic bacteria then break down the waste within the wastewater.
- Some systems utilize a pretreatment stage prior to the main treatment to reduce the chance of clogging the system.
- Electricity is required for system operation.

* Anaerobic wastewater treatment:

- Anaerobic bacteria transform organic matter in the wastewater into biogas that contains large amounts of methane gas and carbon dioxide.
- Energy-efficient process.
- Often used to treat industrial wastewater that contains high levels of organic matter in warm

temperatures.

→ It can be used as a pretreatment prior to aerobic municipal wastewater treatment.

Activated Sludge Process.

→ Microorganism responsible for treatment are maintained in liquid suspension by appropriate mixing methods.

→ Main constituents of ASP are aeration tank in which oxygen is provided for the micro-organism to grow. This aeration also micro-organisms in suspension.

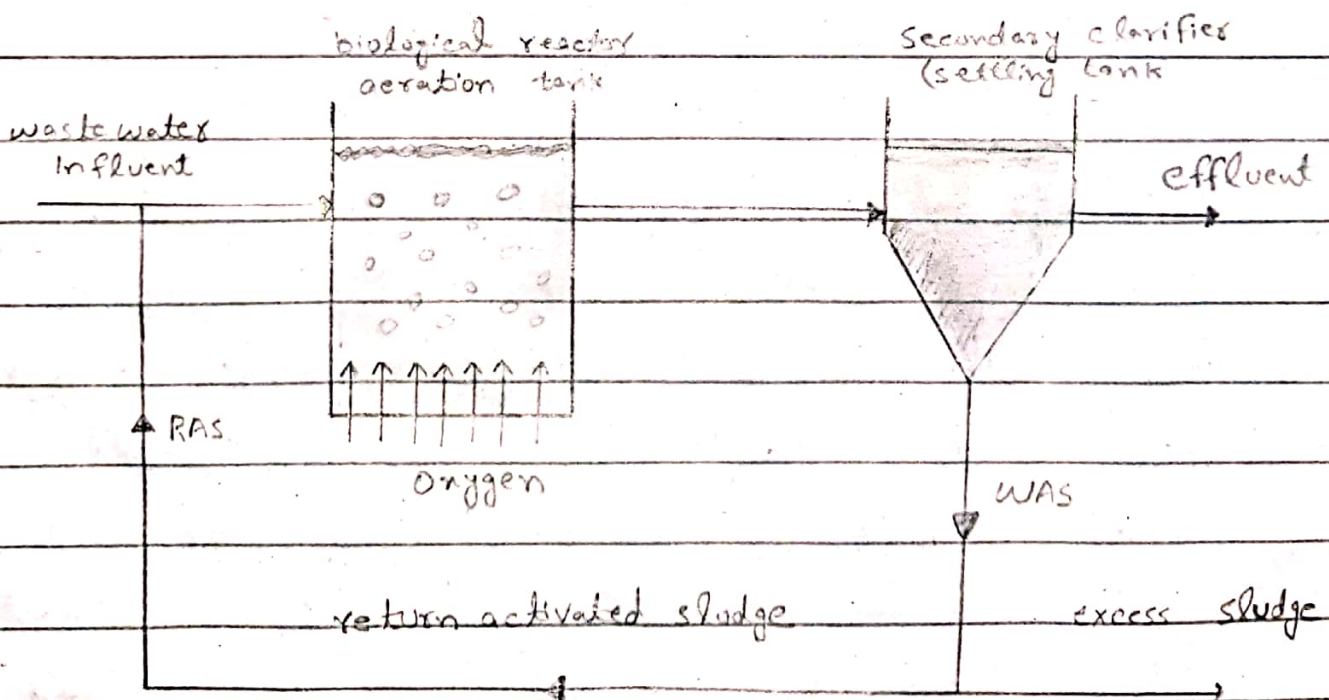
→ Aeration tank is followed by Clarifier / settler in which the micro-organisms from flocs and settled down at the bottom.

→ Formation of floc particles, ranging in size from 50 to 200 μm removed by gravity settling, leaving relatively clear liquid as treated effluent.

→ A part of settled bio flocs are recycled back to the aeration tank to maintain certain amount of micro-organisms in the system for efficient operation of the system.

This is known as Recycled Activated Sludge (RAS).

→ Remaining settled bio flocs are removed from the system and is termed as Wasted Activated Sludge (WAS).



Q 3:-

Ans:-

→ Assimilative capacity of receiving water bodies refers to the ability of a body of water to cleanse itself; its capacity of receive wastewater without deleterious effects, and without causing damage to aquatic life / or humans who consume the water. It is level to which water body or nature control the toxicity without affecting the aquatic life.

→ Although wastewater is properly treated before it is disposed of to the natural water streams still it has impurities pollutants that need to removed or make them less effective so that the receiving water bodies may not becomes unsuitable for use or cause damage to the aquatic life.

1) Dilution:-

Dilution is the process of reducing the concentration of pollutants in receiving water, usually simply by mixing with more quantity of water.

2) Dispersion:-

Dispersion is the distribution of pollutants in relatively large area of water. Dilution and dispersion are interrelated.

3) Sunlight:-

Sunlight facilitates biological decomposition of pollutants and kills pathogens by ultraviolet radiation.

Q4:-

Ans:- Sludge Management:-

Sludge treatment is the processes used to manage and dispose of sewage sludge produced during waste water and drinking water treatment. Sludge is mostly water with lesser amounts of solid material removed from liquid sewage.

Treatment processes.

- Thickening - Gravity and Flootation
- Digestion - Aerobic, Anaerobic
- Mechanical Dewatering - Vacuum filtration, Centrifugation.
- Disposal - Land application, Burial.

Advantages of sludge treatment.

- It reduces pathogens and volume to be disposed.
- Protects wild life, aquatic life and also prevents diseases.

- Sustainable mangement of organic waste.
- Reduction of odors and disease causing agents.
- Producing Bio gas.

Q5:-

Ans: Environmental Impact Assessment.

An environmental study comprising collection of data, prediction of qualitative and quantitative impacts, comparison of alternatives, evaluation of preventive, mitigatory and compensatory measure, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed.

Parameters of importance.

Wastewater contains a large number of contaminants and they are categorised as physical, chemical and biological contaminants.

Different parameters have been established from experience and theory to define such characteristics.

The most important parameters to be considered for a local wastewater treatment plant are:

1) Biochemical Oxygen Demand (BOD).

The BOD is the amount of oxygen consumed by aerobic microorganism to break down the organic matter present in the wastewater. It is the BOD₅ which is the actual measured parameter and is an indication of the amount of organic matter consumed within 5 days as from testing. This value is used to measure the efficiency of a treatment plant in terms of organic matter removal. High BOD value are undesirable and would affect the ecological cycle by reducing the normal dissolved oxygen to critical levels for sustaining aquatic life.

2. Chemical Oxygen Demand (COD).

The COD is an alternate measure of the amount of organic matter. The amount of oxygen used up by a strong oxidising agent is measure. This value is of greater importance when evaluating wastewater from industries since these effluents tend to be toxic to microorganisms thereby affecting the validity of BOD results.

3. Total Suspended Solids (TSS).

The TSS is measured to indicate the amount by mass of fine suspended particles. Effluent discharge in the water course must contain low levels of TSS since TSS cause turbidity, affecting the amount of light to aquatic plants and also causes visual pollution.

4). Total Kjeldahl Nitrogen (TKN)

Wastewater usually contains high levels of nitrogen containing compounds. The nitrogen exists mostly in free forms; organic nitrogen ammonia and reduced nitrogen.

The TKN value hence indicates the amount of nitrogen of all these 3 forms.